Paper/Work
LLNL Postdoc Association Newsletter
December 21, 2011 • Volume 1, Issue 5

The Postdoc Association Interview: Dr. George Miller, Former Director of LLNL

Dr. George Miller led LLNL until November 2011. He graciously met with the Post-Doc Association for the fascinating and informative discussion that we present here. Our interview was conducted on November 30, 2011 by Cedric Rocha-Leao, Lance Simms, and Heather Whitley. Photos by Kevin Melissare; additional editing by Nathan Kugland.

Dr. Miller, during your nearly 40 year long career at LLNL you have been the director since 2006, which includes the challenging transition period from University of California to LLNS management in 2007. Before that, for five years you led the efforts to bring NIF into reality, helping to create the facility that now holds arguably the greatest challenge and greatest promise at the Lab. All of this puts you in an unmatched position to talk about the Lab, its current context, its strengths and the challenges that it will be facing. We thank you for giving us this invaluable opportunity to share your experience with the LLNL Post-Doc community.

In 1972, right after you received your Ph.D., you left Virginia and crossed the country to come to Livermore. Why did you make this choice? George Miller: When I got out of graduate school in 1972 jobs for physicists were hard to come by. I had four job offers: postdoc positions at UCLA, another one in Carnegie Mellon, and also an offer for a job at the Central Intelligence Agency, where my father worked, and a job offer at LLNL. The CIA told me to go to Livermore and learn something, then come back. When the agency called me to come back five years later, I stayed at LLNL because it was such exciting work. It was a combination of really challenging science and cutting edge technology that made the lab so appealing. I found my work here challenging due to breadth of the projects, so I decided to stay.

We could find plenty of information about your career from 1980 on, at which point you became the leader for thermonuclear design and computational development, a role that required finding creative solutions to overcome the increasing difficulties and drawbacks of performing actual nuclear tests. We could not find, however, a lot of information about your first project here at the lab. Did you start as a

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Post-Doc? Can you tell us a little about what you did back then? I joined A Division at the Lab right out of graduate school and my first project was an experimental type of design that was scheduled to be part of the lab's effort for the Mark 4 reentry vehicle on a Navy system. We did one test, and then the assignment went to LANL. Within one year of joining the lab, I was given responsibility for a project developing a very unusual type of nuclear design. As I've told many people over the years, the first project I had to lead failed and that was a humbling experience that I learned from. From 1977–78, I designed different types of nuclear devices, one of which is still in the stockpile. Right after that, I became project leader for another nuclear weapon that was also put in the stockpile.

One of the things that really affected my thought process about where the nuclear weapons program should go when I got in a leadership position was, after a very intense period, my division leader asked me to design a nuclear test that would help us understand the physics that I knew we didn't understand when we designed those previous experiments. I spent several months working with experimentalists to design a test, which was never executed because we came to the conclusion that in the underground, with the diagnostics that were available back then, we couldn't make measurements with sufficient accuracy to answer the physics questions that we wanted to understand. As I became division leader, deputy associate director and associate director, that was one of the things that focused me on developing ways to understand the physics using different types of experiments, including large laser facilities.

Since 1980 you have served in leadership positions in crucial programs, such as ensuring the security of the nuclear stockpile and also NIF. What are some important lessons that these 30 years of leading roles have taught you? A couple of the things, which are sometimes hard for people: it's really important to surround yourself with people who think differently than you do. I don't need somebody to tell me what I think about something, but I really need a variety of input and people who will be willing to challenge me.

The second part of that is engaging a broad group of people from different fields in a same project. The types of problems the lab deals with are typically very broad-based problems, so it's important to get a variety of input.

Another thing that is difficult to learn is where in the process to actually make a decision. A lot of people like to study a problem forever, and this is one of the transitions that one has to make moving from academic basic science to the lab. As an academic, you are free to study a problem until you understand it fully, but in the lab setting, we have to make decisions, and in some cases those decisions have to be based on inadequate data.

Has it been easy to find people who will challenge you? For me? It's easy to find people who will challenge me (laughter). But generally, as you move higher in rank and especially as the director of the Lab, it is harder to find people who will say, 'You're full of crap' but it's extremely important to have that in my view. My early career at the Lab taught me a lot because when we had design reviews, we'd have the most intense arguments about a piece of physics, yet people were able to separate the intellectual arguments from their personal interactions. We used to argue quite loudly at times [and] then go out together and have a beer afterward. It's important to have intense debate and maintain civil personal relationships. You have to have almost a split brain to do it, but it's absolutely important. We do many things that are beyond the state of the art that demand this type of intense debate.

You have partially answered this question already, but as the manager of a Lab that has thousands of employees, what qualities do you like to see in people under your supervision? What did you look for when hiring someone to work with you? In a lab like this, even down at the division and group level, you need a number of different things. You need diversity in thought processes and in skills due to the breadth of problems studied here. Having that breadth of knowledge is really important here. I look for people who can make the transition from being an expert in a small field to understanding a wide range of knowledge, developing diversity and breadth. That's usually hard for people to do [because] they are not trained to do that. You also have to look for people who can work together in teams. In academia you are often in a small group, or working alone on a thesis, but the Lab thrives on large teams of people working

together to solve hard problems.

In this time of economic crisis with intense national political debates, pressing environmental concerns and an increasingly complex international context, what would you say are the main challenges and opportunities the lab has today? The opportunities are easy for me to answer: the solutions to the issues facing the country and the globe require a tremendous scientific and technological component, whether it's economic malaise, threats to security, or environmental issues. When I look around the lab, I see people with the talent to address these issues. It is a world of tremendous opportunities for people to apply their science and technology.

The big challenge is whether the country can maintain the required sustained investment to get things done. NIF is a good example of this. From my perspective, it was a sixty year journey that started with what John Nuckolls proposed in the late 1950s. Sticking with something for that long, if you think of the number of directors, presidents and congressional representatives we have had during that time frame, the challenge to keep sustained investment is immense, yet it is vital to our competiveness.

The answer is clear, but it is hard to do. I wouldn't trade this country for any other country or type of democracy, but the partisan nature that is prevalent today is troublesome. As the former deputy secretary of defense John Hamre wrote to some friends in Europe: the country, the people, are by and large very centrist. The political parties on the other hand are not. That makes for some of the chaos we are seeing now. We as a nation need to find a way to overcome this and go back to the centrist roots of the people.

Along these lines, we have a question that came up at the postdoc offsite career development event that no one could really answer: "What will happen to the lab if NIF fails?" The idea of NIF failing is not really germane; it has already succeeded. The NIF is a unique facility as the world's most energetic laser, most precise and flexible laser and most reliable. Already we have done groundbreaking experiments in support of stockpile stewardship, basic science, and DoD applications. Our work on ignition, generating more energy out than the laser energy in,

is one of the great technology, engineering and science challenges of this century, and it is proceeding smoothly.

Of course many people ask the question, "What will happen if we don't get ignition to happen?" This is an important question, and it [would] depend on why did it fail and whether we understand that failure, if it happens. We are first and foremost a science lab searching for the truth and that is the path we will take. The thing that frequently gets lost when people talk about NIF and what we are trying to do is [an awareness of] what the National Academy charged us with in the late 80s and early 90s. They said they had no doubt that ignition could be achieved in the laboratory but they didn't know if it would happen at 1.8MJ. They said that were several questions regarding the idea that would never be answered theoretically; we'd have to develop a facility to answer them. In my view, many of the Academy's questions have already been answered with a positive outcome. Given the state of knowledge at the time, that in and of itself is an amazing accomplishment. But the problem of getting ignition is hard and we are still working through the issues ahead using the great experimental facility that NIF is, our prodigious computational power and the phenomenal team that the lab has put together.

I think the probability that we will achieve ignition is high. It's harder to say we'll get it this year, but because of the results to date, but I'm cautiously optimistic. On the other hand, if we look ahead with the capabilities that we have to deploy in more advanced targets I believe that this will improve the probability to an even higher lever. If we don't get ignition but understand why we didn't get it, that's a remarkable achievement. I am personally convinced that if this happens we will be off by a little, [for example] let's say instead of 1.8 MJ you [need to] go to 3 MJ for a relatively small investment. Unfortunately there is a perception that ignition at 1.8 MJ is like a light switch, it's either on or off. I don't think this is true, but it's a challenge to combat this perception and we will be continuing our updates as the NIC program continues in the months ahead.

In addition to that, I believe that it is incredibly important to have a burning plasma available for the weapons program, and there's so much spin off technology that comes with the NIF project that it is well worth [the expense] to invest in it.

Why would you say to Post-Docs that LLNL is a good place for them to stay and build their careers? For the reasons that made me stay rather than leave after 5 years working here: the science that goes on at the lab is incredibly fascinating. We have leading research almost anywhere you go: materials science, computational science, chemistry… and the facilities to lead that research are world class. You have the tools here to do a lot of things that you couldn't do in most other places.

While you'll never get rich working at the lab, I believe that the lab does support a comfortable lifestyle. You sort of have to have all three of these things, and I think the lab does have these and I hope that we will be able to continue to provide that.

And for those who want to stay, what skills do they need to develop or enhance to be successful here in the long run? Technically being engaged in something that is really important to the laboratory. Learning to work in a team environment and learning to communicate to a broad audience. I was once out running with my first division leader and he made a comment to me: 'I didn't go to graduate school in physics because I liked people.' I think many of us, myself included, are introverts. I am more comfortable in a corner than talking to people, which I do not get to do as a lab director. You have to learn how to deal with people and communicate your ideas.

There will be few people who we will interact with who will be as knowledgeable as you on a given subject, but you still have to convince them that your work is worth their time or, for people in Washington, worth their money. As technical people we tend to communicate by giving all the details. That won't work with people outside the field. We have to figure out how to boil it down to the essence of what you're trying to do without distorting it.

The demands on you change as you switch to the management level, but it's important that someone who wants to spend their career doing technical work can also succeed at Livermore. The hallmark of Livermore and the hallmark of Lawrence was using other people in a team to leverage yourself, leverage what you want to accomplish, and that requires effective communication. It's not like the army where you can just order people to do something. The lab in my view has always been less hierarchical in the sense that who you are matters more than your job title.

If you could go back to 1972 and meet the young George Miller right out of grad school, what advice would you give him? I would say the two most important things are: first of all to follow your heart. More important than anything, you've got to be doing something you enjoy doing. If you feel strongly about the passion and creativity, it will be utilized to the max. You want to be doing something that matters to you on a personal level.

The other thing is to look for the things that both you and your employer think are important. I think it was important to try to work on something that is important to the country or the lab, but obviously you don't want to do something that contradicts your own values. I don't know whether it's possible any longer, but between when I was hired in 1972 and when I became director, I only

applied for one job [that] I didn't get: director of the lab [at the time] when John Nuckolls was selected. Everything else I did because someone else asked me to do it. There were people mentoring me and advising me all along the way. I did what I did because I thought it was important, but also because others thought it was important.

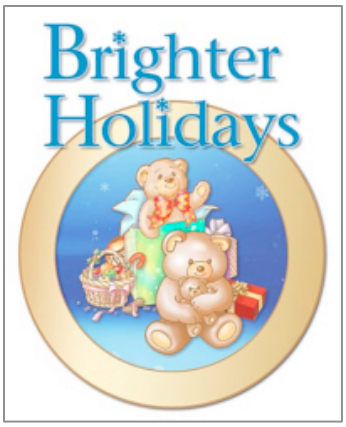
Seems to me that the young George Miller didn't need a lot of advice after all. Now, for your next step, are you looking forward to a quiet retirement or just a change in duties? Retirement really hasn't hit me yet, and I don't have anything planned. As I have so often in my career, I will try to figure it out starting tomorrow. I have been jealous of my wife because she gets to spend a lot of time with our grandchildren and I don't, so I know that I will spend more time with them from now on.

Thank you, Dr. Miller.

(Left to right) Heather Whitley, Cedric Rocha-Leao, George Miller, Lance Simms.

Brighter Holidays Update

Thanks to the incredible generosity of the postdoc community, we were able to raise $920 to help out a family in need through the Brighter Holidays program. This doesn't include individual donations of clothes, books, and a handful of other useful items. The gifts were wrapped up at our wrapping party on Monday and they're ready to be sent to the family this Wednesday! Look for photos and a final report on our Brighter Holidays effort in a future newsletter.



Postdoc Lunch at Sansar Indian on December 8th

We had 10 people in attendance! Thanks to Luc Peterson, Guillaume Hupin, Jeremy Mason, Tyler Ralston, Kyle Lange, Nathan Kugland, Sheldon Wu, Ian Ellis, Paul Martinez, Reggie Drachenberg for coming.

Our next lunch will take place in January. Hope to see you there!

Postdoc-Related Highlights from Notes to the Director

In a recent *Nature Physics* paper, lab scientists and their collaborators from UCSD, LANL, Hemoltz-Zentrum Dresden-Rossendorf, Technische Universitat Darmstadt, and General Atomics describe the production and focusing of intense, high-energy, laser-generated proton beams. Using the Trident laser at LANL, the team generated and focused a proton beam using a cone-shaped target. The protons were found to have unexpected curved trajectories due to the large electric fields in the beam. A sheath electric field also channeled the proton beam through the cone tip, substantially improving the beam focus. The ability to generate high-intensity well- focused proton beams can open the door to new regimes in high-energy density science, as well as applications in materials science and medicine. Livermore researchers on the paper were lead author Teresa Bartal (a UCSD PhD student and Lawrence scholar when this research was conducted), Mark Foord, **Claudio Bellei** (a postdoc in PLS), Michael Key, Pravesh Patel, Drew Higginson, and Harry McLean.

"Focusing of short-pulse high-intensity laser-accelerated proton beams," T. Bartal *et al.*, doi:10.1038/nphys2153

Selected Recent Research Publications by LLNL Postdocs

Bold = LLNL Postdoc. We have received many contributions and will steadily publish them all over the next several newsletters. Broadcast your achievements here! Make new connections & help us see well we are doing collectively.
Guidelines: 1) Peer-reviewed publications only, no manuscripts in progress; 2) Your affiliation must be LLNL; 3) Note which authors are LLNL postdocs, and in what division & group; 4) Send the full citation including title to Nathan (kugland1@llnl.gov).

Computation/CASC/ROSE Team: **Peter Pirkelbauer**, Chunhua Liao, Thomas Panas, Daniel Quinlan, "Runtime Detection of C-Style Errors in UPC code," Proceedings of the Fifth international conference on Partitioned Global Address Space Models (PGAS'11).

Engineering Technologies: **Hopkins, J.B.**, "Synthesizing Parallel Flexure Concepts that Mimic the Complex Kinematics of Serial Flexures Using Displaced Screw Systems," Proc. of the ASME 2011 International Design Engineering Technical Conferences & Computers and Information in Engineering Conference IDETC/CIE 2011, Washington, DC, August 2011.

National Ignition Facility/Plasma Physics Group: **Ross, J. S**, Kilne, J. L, Yang, S, Henesian, M, Weiland, T, Price, D, Pollock, B. B, Glenzer, S.H., "4w Thomson scattering probe for high-density plasma characterization at Titan," Rev Sci Instrum 81, 10D524 (2010).

National Ignition Facility/Plasma Physics Group: A. Pelka, G. Gregori, D. O. Gericke, J. Vorberger, S. H. Glenzer, M. M. Gunther, K. Harres, R. Heathcote, **A. L. Kritcher**, **N. L. Kugland**, B. Li, M. Makita, J. Mithen, D. Neely, C. Niemann, A. Otten, D. Riley, G. Schaumann, M. Schollmeier, An. Tauschwitz, and M. Roth, "Ultrafast Melting of Carbon Induced by Intense Proton Beams," Phys. Rev. Lett., 105, 265701 (2010).

National Ignition Facility/Plasma Physics Group: **A.L. Kritcher**, T. Doeppner, C. Fortmann, O.L. Landen, R. Wallace, S.H. Glenzer, "Development of X-ray Thomson scattering for implosion target characterization," High Energy Density Physics, 7 271 (2011).

National Ignition Facility/Plasma Physics Group: S.H. Glenzer, H.J. Lee, P. Davis, T. Doeppner, R.W. Falcone, C. Fortmann, B.A. Hammel, **A.L. Kritcher**, O.L. Landen, R.W. Lee, D.H. Munro, R. Redmer, S. Weber, "Dense plasma X-ray scattering: Methods and applications," High Energy Density Physics, 6 1 (2010).

NSED/SIAS: T. Lemmond, **P. Kidwell**, **K. Boakye**, N. Perry, J. Guensche, J. Nitao, W. Hanley, **R. Prenger**, R. Glaser, "Pattern Based Aggregation of Named Entity Extractors," Proc. of 7th International Conference on Data Mining (DMIN), 2011.

NSED/SIAS: Saptarshi Guha, **Paul Kidwell**, Asharth Barhur, William S. Cleveland, John Gerth, Matt Bullard, "A Streaming Statistical Algorithm for Detection of SSH Keystroke Packets in TCP Connections," Proc. of the 12th INFORMS Computing Society Conference, 2011.

PLS/CMMD/Target Systems and Optics Technology (TSOT): **R.N. Raman**, C.D. Pivetti, R. Ramsamooj, D.L. Matthews, C. Troppmann, and S.G. Demos, "Factors influencing rat survival in a warm renal ischemia model: time to adapt the protocols," Transplant Proc 43, 1511-1514 (2011)

PLS/CMMD/Target Systems and Optics Technology (TSOT): **R.N. Raman**, R.A. Negres, and S.G. Demos, "Time-resolved microscope system to image material response following localized laser energy deposition: exit surface damage in fused silica as a case example," Opt Eng 50, 013602 (2011)

PLS/CMMD: **D. E. Fratanduono**, T. R. Boehly, P. M. Collins, J.H. Eggert, R.F. Smith, D. G. Hicks, G. W. Collins and D. D. Meyerhofer, "The Direct Measurement of Ablation Pressure Driven by 351- nm Laser Radiation," J. Appl. Phys., 110, 073110, (2011).

PLS/CSD: Westbrook, C. K.; Pitz, W. J.; **Mehl, M.**; Curran, H. J., "Detailed chemical kinetic reaction mechanisms for primary reference fuels for diesel cetane number and spark-ignition octane number," Proceedings of the Combustion Institute; 33; p 185-192; 2011

PLS/CSD: **Mehl, M.**; Pitz, W. J.; Westbrook, C. K.; Yasunaga, K.; Conroy, C.; Curran, H. J.; Autoignition behavior of unsaturated hydrocarbons in the low and high temperature regions; Proceedings of the Combustion Institute; 33; p 201-208; 2011

PLS/CSD: Naik, C. V.; Westbrook, C. K.; Herbinet, O.; Pitz, W. J.; **Mehl, M.**; Detailed chemical kinetic reaction mechanism for biodiesel components methyl stearate and methyl oleate; Proceedings of the Combustion Institute; 33; p 383-389; 2011

Selected Recent Research Publications by LLNL Postdocs, Continued

PLS/Physics/Experimental Nuclear Physics: Yu. Ts. Oganessian, F. Sh. Abdullin, P. D. Bailey, D. E. Benker, M. E. Bennett, S. N. Dmitriev, J. G. Ezold, J. H. Hamilton, R. A. Henderson, M. G. Itkis, Yu.V. Lobanov, A. N. Mezentsev, K. J. Moody, **S. L. Nelson**, A. N. Polyakov, C. E. Porter, A.V. Ramayya, F. D. Riley, J. B. Roberto, M. A. Ryabinin, K. P. Rykaczewski, R. N. Sagaidak, D. A. Shaughnessy, I.V. Shirokovsky, M. A. Stoyer, V. G. Subbotin, R. Sudowe, A. M. Sukhov, Yu. S. Tsyganov, V. K. Utyonkov, A. A. Voinov, G. K. Vostokin, and P. A. Wilk, "Eleven new heaviest nuclei with atomic numbers Z=117 to Z=105 identified among the products of 249Bk+48Ca reactions," Phys. Rev. C 83, 054315 (2011).

PLS/Physics/Optical Sciences Group: Rosario, D.; McGurk, R.; Max, C.; Shields, G.; Smith, K.; and **Ammons, S.M.,** "Adaptive Optics Imaging of QSOs with Double-Peaked Narrow Lines: Are they Dual AGNs?", Astrophysical Journal, 739, 44. 2011

PLS/Physics/Optical Sciences Group: **Ammons, S.M.**; Bendek, E., and Guyon, O. "Microarcsecond relative astrometry from the ground with a diffractive pupil," SPIE, 8151, 25. 2011

PLS/Physics/X-ray Science and Technology Group: **M. Fernández-Perea**, J. I. Larruquert, J. A. Aznárez, J. A. Méndez, L. Poletto, F. Frassetto, A. M. Malvezzi, D. Bajoni, A. Giglia, N. Mahne, S. Nannarone, "Transmittance and optical constants of Ho films in the 3-1,340 eV spectral range," Journal of Applied Physics, 109, 083525-1 a 8 (2011).

Meet the Postdoc Association Leadership Council

Nuclear scientist Sarah Nelson Wilk helped start our Postdoc Association

Hi there, I'm Sarah and I joined the lab as a postdoc in late 2008. For the first two years of my postdoc I worked in the Chemical Sciences Division's stockpile radiochemistry group matrixed to NIF, starting on the gas- and solid-phase sample collection diagnostics. In my third year I transitioned to the Physics Division matrixed to Global Security's N program, working on a suite of neutron measurements for advanced neutron multiplicity detectors. On the side I have been involved with the Heavy Elements research group. In 2009 I was thrilled to participate in a trip to Russia, working on the long experimental campaign that led to the discovery of the new element 117! This heavy element work is close to my heart because it is very similar to my dissertation research from UC Berkeley and Lawrence Berkeley National Lab, where I worked on compound nucleus reactions at the 88-Inch Cyclotron. However, my postdoc wasn't my first time at LLNL — I was a summer student in both 2002 and 2003 with the Glenn Seaborg Institute.

When I wasn't busy with research, I was working to get the Postdoc Association rolling with Heather Whitley, Joel Bernier, and other postdocs-turned-staff at the lab. I am proud to see the LLPA continue and flourish in its third year. I will be leaving the lab in January to participate in the National Academies' Christine Mirzayan Science and Technology Policy Graduate Fellowship Program in Washington DC. I look forward to learning about the intersection of science, policy, and diplomacy, particularly in the area of nuclear nonproliferation.

LLNL Postdoc Association Leadership Council

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